

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 April 2001 (12.04.2001)

PCT

(10) International Publication Number
WO 01/26129 A1

(51) International Patent Classification⁷:
H01J 5/46,
H01K 1/40

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(21) International Application Number: PCT/EP00/09483

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(22) International Filing Date:
26 September 2000 (26.09.2000)

(81) Designated States (national): CN, JP, US.

(25) Filing Language: English

(84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

(26) Publication Language: English

(30) Priority Data:
99203224.3 1 October 1999 (01.10.1999) EP

Published:

— With international search report.

— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

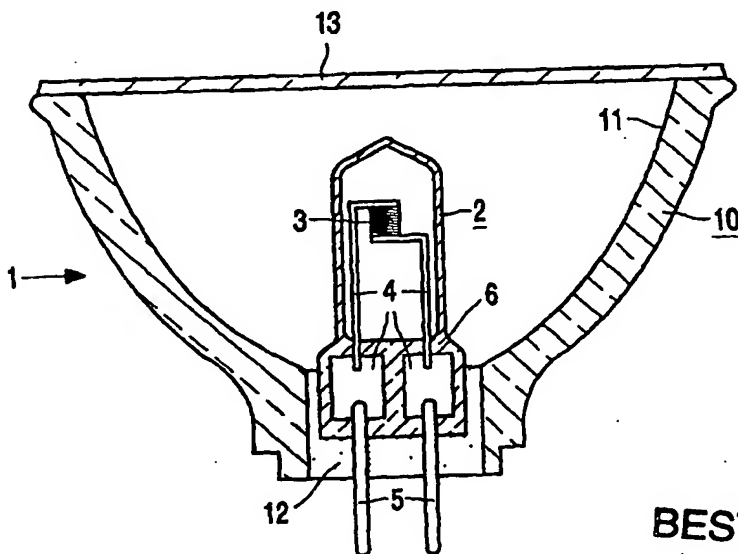
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ELECTRIC LAMP



(57) Abstract: The electric lamp (1) has a lamp vessel (2), wherein an electric element (3) is accommodated. Said element is connected to current conductors (4), molybdenum end portions (5) of which extend outside the lamp vessel and have a skin of titanium nitride or chromium carbide as a protection against oxidation.

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Electric lamp.

The invention relates to an electric lamp comprising
a glass lamp vessel which is closed in a gastight manner and in which an
electric element is accommodated,
current conductors connected to the electric element which each have an end
5 portion of molybdenum projecting to outside the lamp vessel, said end portion being provided
with means for protection against oxidation.

Such an electric lamp is known from EP 573 114.

10 Current conductors with molybdenum end portions are often used in electric
lamps because this metal is resistant to high temperatures and because this metal has a
coefficient of expansion which matches that of hard glasses well and deviates only little from
that of quartz glass, i.e. glass with an SiO_2 content of at least 95% by weight.

15 It is a disadvantage of molybdenum, however, that it readily oxidates at room
temperature already, so that there is a considerable risk that a good electrical contact with, for
example, the connection terminals of a lampholder will be lost.

According to the cited patent document, the end portions are provided with a
molybdenum nitride coating. A disadvantage of the known lamp is, however, that an oxidation
resistance up to no more than a comparatively low temperature, i.e. approximately 200 °C, is
20 obtained. Furthermore, the coating has the additional disadvantage that the end portions
become more liable to fracture.

It is an object of the invention to provide an electric lamp of the kind described
25 in the opening paragraph in which the above disadvantages are counteracted.

According to the invention, this object is achieved in that the electric lamp of
the kind described in the opening paragraph is characterized in that the end portion has a skin
which is chosen from a group of materials formed by titanium nitride and chromium carbide.

The titanium nitride or chromium carbide skin is not only easy to realize, but it is also an effective agent against oxidation not only at room temperature but also at elevated temperatures, for example up to approximately 400 °C. Titanium nitride and chromium carbide, moreover, have the advantages that they do not lead to an increased brittleness of the molybdenum end portion and that they are thermally stable also at very high temperatures, for example 2000 °C. That is to say that titanium nitride and chromium carbide substantially do not form compounds or alloys with molybdenum which melt at lower temperatures than those used in the manufacture of the lamp. The thermal stability at very high temperatures also implies that no dissociation of the compounds occurs owing to the high temperature, leading to compounds which are unsuitable for the oxidation-resistant coating. This renders said compounds suitable for use as a skin on metal parts which is effective against oxidation, for example in lamps, for example quartz glass lamps, for which very high temperatures are used in the lamp manufacturing process.

Preferably, the skin has a layer thickness of at least 2 µm and at most 3 µm. A layer thickness below 2 µm provides the molybdenum with an insufficient protection against oxidation. A layer thickness above 3 µm is unnecessarily expensive because it does not provide any better protection against oxidation than a skin with a layer thickness of 3 µm.

The oxidation-resistant skin on the molybdenum end portion may be readily obtained in a vapor deposition process, for example a CVD process. The CVD process has the advantage that many molybdenum end portions can be vaporized simultaneously in one and the same process. A molybdenum end portion provided with an oxidation-resistant skin can thus be manufactured comparatively inexpensively.

In spite of the protection against oxidation provided by the titanium nitride or chromium carbide skin, the protected end portion can be processed in a conventional manner, for example by welding to a metal foil, for example to a molybdenum foil on which a gastight seal of the lamp vessel is realized. A good electrical connection, which is only a few mΩ larger than in the case of platinum or platinum-plated end portions, can be realized on the protected end portion, for example by means of contacts of a lampholder.

The electric element of the lamp may be a pair of electrodes in an ionizable gas or an incandescent body, for example in an inert gas comprising halogen. The lamp vessel may have one or several seals from which a current conductor issues to the exterior. The lamp vessel, for example made of quartz glass or hard glass, may be joined together with a reflector body so as to form a lamp.

An embodiment of the electric lamp according to the invention is shown in longitudinal sectional view in the drawing.

5 In the figure, the electric lamp 1 has a glass lamp vessel 2 which is closed in a gastight manner and in which an electric element 3, an incandescent body in the Figure, is accommodated, and a reflector body 10 which has a mirroring surface 11 and a closing plate 13. The lamp vessel 2 is secured in the reflector body 10 by means of cement 12. Current conductors 4 having molybdenum end portions 5 projecting to outside the lamp vessel 2 are
10 connected to the electric element 3. The end portion 5 has means for protection against oxidation. The end portion 5 for this purpose has a skin of chromium carbide. The skin has a layer thickness of approximately 2.5 μm .

In the Figure, the current conductors 4 comprise legs of the incandescent body 3 and molybdenum foils connected thereto by means of welds. End portions 5 provided with
15 chromium carbide skins are also welded to the foils and serve as contact pins for the lamp.

Experiments with this lamp 1, which has a rated power of 100 W and a lamp voltage of 12 V, have demonstrated that the lamp 1 has a useful life which is twice that of a known lamp, and a useful life equal to that of a lamp having end portions 5 provided with a platinum coating.

20 The lamp shown may be used, for example, for accent lighting, for projection purposes, or for photo, video, or film recording sessions.

CLAIMS:

1. An electric lamp comprising
a glass lamp vessel (2) which is closed in a gastight manner and in which an
electric element (3) is accommodated,
current conductors (4) connected to the electric element which each have an end
5 portion (5) of molybdenum projecting to outside the lamp vessel, said end portion being
provided with means for protection against oxidation,
characterized in that the end portion (5) has a skin which is chosen from a group
of materials formed by titanium nitride and chromium carbide.
- 10 2. An electric lamp as claimed in claim 1, characterized in that the skin has a layer
thickness of at least 2 μm and at most 3 μm .

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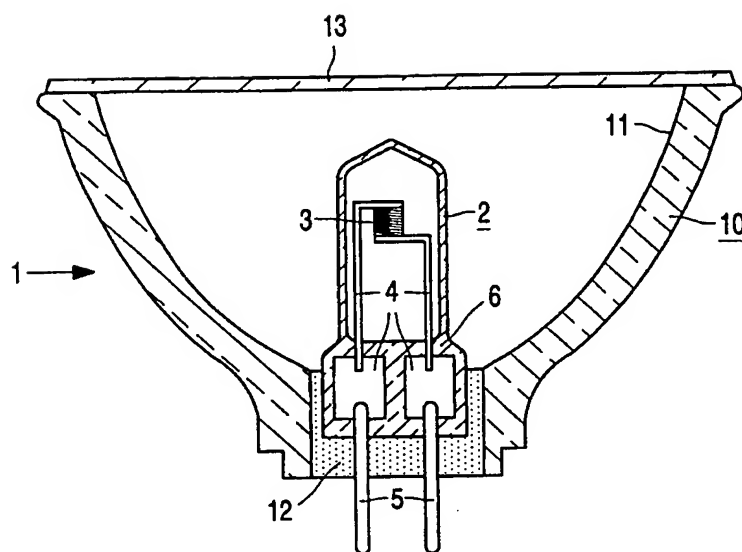


FIG. 1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/09483

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01J5/46 H01K1/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01J H01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 923 470 A (DAMSTEEG CORNELIS JAN ET AL) 2 December 1975 (1975-12-02) claims 1,2	1,2
Y	EP 0 573 114 A (PHILIPS ELECTRONICS NV) 8 December 1993 (1993-12-08) cited in the application claim 1	1,2
A	US 4 039 883 A (DAMSTEEG CORNELIS JAN ET AL) 2 August 1977 (1977-08-02) claims 1,3	1,2
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

19 January 2001

Date of mailing of the international search report

29/01/2001

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 272 (E-777), 22 June 1989 (1989-06-22) & JP 01 063255 A (TDK CORP), 9 March 1989 (1989-03-09) abstract ----	1
A	US 5 624 769 A (LI YANG ET AL) 29 April 1997 (1997-04-29) claims 1,3 ----	1,2
A	US 5 254 359 A (ZURECKI ZBIGNIEW ET AL) 19 October 1993 (1993-10-19) claim 1 ----	1
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 04, 30 April 1999 (1999-04-30) & JP 11 012566 A (HITACHI METALS LTD), 19 January 1999 (1999-01-19) abstract -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/09483

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3923470 A	02-12-1975	NL 7209332 A	08-01-1974
		AU 5744873 A	09-01-1975
		BE 801807 A	02-01-1974
		CA 978426 A	25-11-1975
		DE 2330169 A	24-01-1974
		FR 2190569 A	01-02-1974
		GB 1435541 A	12-05-1976
		JP 49052750 A	22-05-1974
		JP 53047776 B	23-12-1978
		US 4039883 A	02-08-1977
EP 0573114 A	08-12-1993	CN 1082761 A,B	23-02-1994
		DE 69307595 D	06-03-1997
		DE 69307595 T	24-07-1997
		ES 2099365 T	16-05-1997
		JP 6052840 A	25-02-1994
		US 5698946 A	16-12-1997
US 4039883 A	02-08-1977	NL 7209332 A	08-01-1974
		AU 5744873 A	09-01-1975
		BE 801807 A	02-01-1974
		CA 978426 A	25-11-1975
		DE 2330169 A	24-01-1974
		FR 2190569 A	01-02-1974
		GB 1435541 A	12-05-1976
		JP 49052750 A	22-05-1974
		JP 53047776 B	23-12-1978
		US 3923470 A	02-12-1975
JP 01063255 A	09-03-1989	NONE	
US 5624769 A	29-04-1997	DE 69603938 D	30-09-1999
		DE 69603938 T	20-01-2000
		EP 0780916 A	25-06-1997
US 5254359 A	19-10-1993	US 5304417 A	19-04-1994
		US 5352523 A	04-10-1994
JP 11012566 A	19-01-1999	NONE	

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